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The first part of this document describes the following four new managerial tools available to the educational administrator: Planning-programming-budgeting, systems analysis, PERT or the critical path method, and the Delphi technique which employs the systematic solicitation and collation of expert opinion to achieve consensus in the formulation of goals. The second part is an annotated bibliography which lists 73 books, reports, journal articles, bibliographies, and government publications related to the decision making process, published between 1963 and 1968. (JK)

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PROGRAM BUDGETING AND OTHER NEWER MANAGEMENT TOOLS IN HIGHER EDUCATION: A DESCRIPTION AND ANNOTATED BIBLIOGRAPHY

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FOREWORD

Higher education is already a complicated business. It will become more complicated. Decision-makers will be called upon to make major decisions involving staff, students, programs and resources. These decisions should be good decisions; they should be based on careful analysis and sound judgment. This publication discusses some of the newer techniques: program budgeting, systems analysis, PERT and the Delphi method. It also includes an annotated bibliography for those interested in learning more about the managerial tools available.

Robert S. McNamara, shortly after becoming Secretary of Defense in 1961, defined his managerial philosophy as follows:

> I think that the role of a public manager is very similar to the role of a private manager; in each case he has the option of following one of the two major alternative courses of action. He can either act as a judge or a leader. In the former case, he sits and waits until subordinates bring him problems for solution, or alternatives for choice. In the latter case, he immerses himself in the operations of the business or the governmental activity, examines the problems, the objectives, the alternative courses of action, chooses among them, and heads the organization to their accomplishment. In the one case, it's a passive role; in the other case, an active role.

To be a leader with an active role requires an understanding of many managerial techniques, including the four tools which are the subject of this paper.

Planning-Programming-Budgeting is a system aimed at helping management, by studying alternative ways to attain educational objectives, make decisions on the allocation of resources.

Systems analysis is nothing more than quantitative common sense aided by modern analytical methods. It is simply a method to provide the decision-maker with relevant data organized in a way most useful to him. It is no substitute for sound and experienced judgment, and it is but one of the many kinds of information needed by the college administrator. It will help college administrators to see more clearly the true cost and benefit of programs; it will not be able to measure accurately the cost and benefit of all possible programs in the campus setting. The realistic goal of systems analysis is the improvement of the decision-making process, not the creation of a mechanism that automatically produces ideal decisions.

Although the CPM/PERT concepts have been used by some colleges, principally with construction, the uses are much broader. The meaning of the acronym "CPM" means "Critical Path Method;" "PERT" means "Program Evaluation and Review Technique." Evidence which relates the success of CPM/PERT is too impressive to be ignored. One college programmed its opening by means of PERT. Many processes, including registration, can be worked out by using PERT.

Delphi, named in honor of the oracle Apollo, is a relatively new method employed to achieve a consensus without committee involvement. One concern shared by many is that systems analysis will place a premium on analytical and statistical studies. Such need not be the case. The Delphi method is one technique which has been developed to obtain, in a systematic manner, judgments of experts. It does not require face-to-face confrontation, and it substitutes a computed consensus for an agreed-on majority opinion. One application of the method might be in developing long-range goals. Olaf Helmer has been the principal architect of the method.

The Center has attempted to provide a timely service by compiling the annotated guide to materials relating to newer managerial techniques. These techniques are primarily tools for high level decision-making; they will not be worthwhile unless top administrators understand them, want them and use them.

Frederic T. Giles, Director
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I. PLANNING-PROGRAMMING-BUDGETING SYSTEM

Introduction

Among the newer managerial tools available to the educational administrator is the planning-programming-budgeting system (PPBS). It has particular relevance for higher education, especially publicly supported higher education. Jesse Unruh, Speaker of the California Assembly, stated what amounts to a warning:

> In my judgment, well-informed legislators, governors, and administrators will no longer be content to know, in mere dollar terms, what constitutes the abstract needs of the schools... . The politician of today is unimpressed with continuing requests for more input without some concurrent idea of the schools output.[1]

A college is a service-oriented, non-profit agency. As with most other service-oriented agencies, the outputs or benefits are difficult to measure, especially difficult in qualitative terms. Yet some measures can be developed.

In a college setting, the needs, which the college is designed to meet, are seldom clearly perceived in terms of the region and the populations to be served by a college. Goals stated to meet the needs, if stated at all, are seldom quantified, are seldom specific. Objectives stated to meet the goals tend to be fuzzy. Overall planning is usually poor. At least, it is not as good as it should be. One of the reasons is that there is seldom any communication between planners and budgeters.

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[1] Quoted by Elaine Exton in the *American School Board Journal* (February 1967), 15.

All colleges make use of budgets. Many colleges are extensively engaged in planning activities over extended time line horizons. What seems lacking, in a conceptual way, is a merger--an integration--of all these activities into a system conducive to decision-making. A system based on PPB requires constant reiteration of the word sequence: planning-programming-budgeting. The budget is a derived factor. It is not a primary document. It is derivative of larger aims and larger objectives. The iteration of the terms in PPB produces a system by which a program budget is based on the idea that analytic questions gain visibility and that economic variables are addressed within an over-all planning context. The over-all planning context, in turn, generates alternative means for achieving on-going goals and objectives. The system should, therefore, explicate for the policy-makers the consequences of considered alternatives. As a result, the budget becomes a derivative of the process. Richard S. Eckaus assessed the present situation in this manner:

> The patterns that now exist represent the influence of tradition and of occasional crises more than they indicate rational planning... . Though we have muddled through in the past, the internal and external pressures on our system will not validate such behavior much longer.[2]

He sees a brighter future with the utilization of economic analysis.

> Economic analysis of education potentially can contribute a great deal to the understanding required for the formulation of an educational policy that will make the best use of human resources and contribute

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[2] Richard S. Eckaus, "Education and Economic Growth," *Economics of Higher Education* edited by Selma J. Mushkin, p. 128.

most to economic growth. Not all education, of course, has an economic motivation, but this does not preclude concentration on the economics of education.[3]

Harry Williams, in his study for the American Council on Education, provided this blunt warning: "One important argument for program budgeting is that if colleges and universities do not engage in this type of self-examination, then trustees, regents, and state legislatures may be expected to undertake their own studies."[4]

The warning becomes quite real when public supported institutions realize that a "fifth of the nation's output is allocated, not by individual choices in markets, but by public decision-making."[5]

Recently the Governors' Conference Committee on State Planning drew the following conclusion:

> Every Governor understands that we must develop more sophisticated ways of sorting facts, of facing issues, of opening options, to make better decisions if we, as States, are to continue as effective partners in our federal system. We must have means to survey where we are, what the gaps in our efforts are, what our goals should be, what the alternative means and ways to these goals are, what the costs and benefits are, what the relative priority between various goals is.

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[3] *Ibid.*, p. 102.

[4] Harry Williams. *Planning for Effective Resource Allocation in Universities*, p. 59.

[5] Otto Eckstein. *Public Finance* (Second Edition), p. 21.

> The list is well known, but for some reason, these questions have never excited the imagination.[6]

Budgeting is both a science and an art. As a science it has its roots in economics. As an art budgeting must be viewed in its political context. Even a casual observer must conclude that the science of budgeting is being applied to large areas formerly considered solely the realm of the art of budgeting. The art has a base in science today. However, the converse is equally true, or should be true. The science permits the art full partnership. Katzenbach makes the point in his introduction to Williams' book.

> First, program budgeting is an approach, not a formula. Budgeting, therefore, must be conceived as an art as well as a science, a product of imaginative thinking as well as sound research.
>
> Second, program budgeting must deal with the future, because only by projecting figures can their true magnitude be appreciated. A decision on $10,000 a year becomes over a period of five years a decision of $50,000.
>
> Third, the satisfied budgeter is simply a man whose well of ideas has run dry or whose unwillingness to search for alternatives marks him a timid decision-maker.[7]

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[6] U. S. Senate. *Criteria for Evaluation in Planning State and Local Programs*, A Study by the Subcommittee on Intergovernmental Relations, p.v.

[7] Edward L. Katzenbach, Jr. "Foreward" to *Planning for Effective Resource Allocation* in Universities by Harry Williams, pp. v-vi.

Before turning to other aspects of PPBS, it is necessary to repeat the point which Melvin Anshen makes so well:

> ... it [program budgeting] will not in itself provide answers to problems or make decisions for managers. It will not displace management judgment, wisdom, or experience. It will not determine objectives. It will not judge performance. In short it will enlighten major decision issues and help managers to manage.[8]

Defining PPBS

On the morning of August 25, 1965, President Lyndon B. Johnson held a breakfast meeting with Cabinet members and agency heads. The president announced that a Planning-Programming-Budgeting System would be installed throughout the Executive Branch. In a press statement following the meeting, he said:

> I am asking each of them [Cabinet members and agency heads] to immediately begin to introduce a very new and a very revolutionary system of planning and programming and budgeting throughout the vast Federal Government, so that through the tools of modern management the full promise of a finer life can be brought to every American at the lowest possible cost.[9]

"In short," he said, "we want to trade in our surreys for automobiles, our cannon for new missiles."[10]

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[8] Melvin Anshen. "The Federal Budget as an Instrument for Management and Analysis," *Program Budgeting: Program Analysis and the Federal Budget* edited by David Novick, p. 23.

[9] Presidential quotes are from the *Public Papers of the President of the United States, Lyndon B. Johnson, 1965.* Book II.

[10] *Loc. cit.*

Actually there is nothing new in the PPBS ingredients except the order and emphasis of the parts within a total system. As early as 1924 a form of PPBS was in use at DuPont and General Motors.[11] Gerhard Cohn, Chief Economist of the National Planning Association, says, "There is little new in the individual concepts of the planning, programming and budgeting system. The newness arises primarily from the combination of these concepts into a package, and the systematic application of the package to governmental decision-making."[12]

As an integrated whole the system was installed in the Department of Defense by Robert McNamara. When he took over the Department of Defense in January of 1961, McNamara discovered several problems in the sphere of decision-making:

1. There was no way for the Secretary to plan or identify objectives.
2. There was a separation between the planners and the budgeters which created confusion for the decision-makers.
3. There was an inability to specify the accomplishments of existing programs or to predict the expected accomplishments of a new program.
4. There was no system for identifying the least cost alternative; in fact, there were no alternatives.
5. There was no method to show future year costs of the present program.
6. There was too short a period of time for good evaluation prior to decision.

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[11] See David Novick. *Origin and History of Program Budgeting.* The RAND Corporation, October 1966.

[12] From the Preface of *Program Planning for State, City and County Objectives* by Harry Hatry and John Cotton, a monograph from the State-Local Finances Project, The George Washington University, 1967.

The Secretary appointed Charles Hitch as Comptroller. This is the same Charles Hitch who was recently appointed president of the University of California to succeed Clark Kerr--an obvious indication that PPBS will have a full-scale trial in higher education. Hitch placed the entire defense establishment under nine "programs" instead of the multiple object groupings which pitted one service against another. Each of the nine "programs" was subdivided into "program elements"--about 800 of them.[13]

McNamara's innovation--from a managerial point of view--met with amazing success. No previous Secretary of Defense had been able to solve the fantastic management problems which beset the nation's defense establishment. The President observed the Pentagon experiment with interest. Based on his observation, he decided to employ PPBS throughout the entire Federal Government.

In making his announcement to the members of the Cabinet and the heads of the numerous agencies, President Johnson instructed each division to institute PPBS. He declared that once in operation the system will enable policy-makers to:

1. Identify our national goals with precision and on a continuing basis.
2. Choose among those goals the ones that are most urgent.
3. Search for alternative means of reaching those goals most effectively at the least cost.

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[13] For fuller discussions of this phase of PPBS, see Charles Hitch and Roland McKean, *The Economics of Defense in the Nuclear Age*, Charles Hitch, *Decision-Making for Defense*, and Daniel Seligman, "McNamara's Management Revolution," *Fortune* (July 1965), 117-121 ff.

4. Inform ourselves not merely on next year's costs, but on the second, and third, and subsequent year's costs of our programs.

5. Measure the performance of our programs to insure a dollar's worth of service for each dollar spent.[14]

This system will improve our ability to control our programs and our budget rather than having them control us. It will operate year round. Studies, goals, program proposals, and reviews will be scheduled throughout the year instead of being crowded into 'budget time.'

To establish this system and carry out the necessary studies, each of you will need a central staff for program and policy planning accountable directly to you. To make this work will take good people, the best you now have and the best you can find. (Italics supplied)

I intend to have the 1968 budget and later year programs presented in this new form by next spring.[15]

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[14] Statement by President to Cabinet Members and Agency Heads on the New Government-Wide Planning and Budgeting System, *op. cit.*

[15] *Ibid.* The sentence above has been underlined in order to stress the fact that the installation of PPBS is expensive. It requires internal reorganization in central staff; it requires studies, data, analysis of alternatives, financial projections and--most of all--the technical staff. Recognizing this, President Johnson, in his Budget Message on January 24, 1967, said, in part: "I urge the Congress to approve the funds requested in the budgets of various Federal agencies to make possible this improvement [PPBS] in the management of Federal resources " Later in his Congressional Message on "The Quality of American Government," March 17, 1967, he urged support: "To continue this vital work I urge that Congress approve the funds for PPBS requested in the budgets of various Federal agencies."

Subsequently, the Bureau of the Budget issued Bulletin No. 66-3, which outlined the procedures by which the system was to be installed in the vast Federal Government. On July 18, 1967, the Bureau of the Budget issued Bulletin No. 63-2 providing revised guidelines. It stated, in part:

> The principal objective of PPB is to improve the basis for major program decisions, both in the operating agencies and in the Executive Office of the President. To do this, it is necessary to have clear statements of what the decisions are and why they were made. Program objectives are to be identified and alternative methods of meeting those objectives are to be subjected to systematic comparison. Data are to be organized on the basis of major programs, and are to reflect future as well as current implications of decisions. As in the case of budgeting generally, PPB applies not only to current programs, but to proposals for new legislation. The budget is the financial expression of the underlying program plan. The budget review will therefore be conducted primarily in program terms for each agency to which this Bulletin applies. It is essential that the Program Memoranda, Program and Financial Plan, and Special Studies provide adequate bases for these decisions. The budget, however, is submitted and must be justified to the Congress in terms of individual appropriations. The program decisions must, therefore, be translated into appropriation requests, and the relationship for these requests to the program decision must be clearly set forth.[16]

The most recent guidelines from the Bureau of the Budget are to be found in Bulletin No. 68-9 (April 15, 1968). Few changes of significance are noted; however, much greater attention is focused on the supporting documents, the Program Memorandum, the Program and Financial Plan and the Special Studies.

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[16] Bureau of the Budget. Bulletin No. 68-2 (July 18, 1967).

The documents referred to have very specific functions. For example, the Program Memoranda (PM) is a succinct presentation of the agency's program recommendations within the agency's objectives. The PM identifies the alternatives. It also provides support for the recommendation in terms of their contribution to the achievement of the objectives.

The Program and Financial Plan (PFP) is a comprehensive multi-year plan of the objectives, including input and output. All costs are included. Periodical review and revision are essential elements. Usually a plan is rather specific for a period of about five years, but projected in less specific terms for 20 or 30 years.

The Special Studies (SS) are the analytical basis for the decisions on the program issues in the PM. Special Studies are in depth views of the objectives and the effectiveness of the efforts being made. Major emphasis is on specific recommendations for future action. For example, HEW rehabilitation, adult basic education, work-experience and training, vocational education and Title I of the Elementary and Secondary Education Act.[17]

The primary distinctive characteristics of PPB are:[18]

1. It focuses on identifying the fundamental objectives of the government and then relates all activities to these (regardless of organizational placement).

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[17] Elizabeth B. Drew. "HEW Grapples with PPB," *The Public Interest* (Summer 1967), pp. 22-24.

[18] Hatry and Cotton, *op. cit.*

2. Future year implications are explicitly identified.

3. All pertinent costs are considered.

4. Systematic analysis of alternatives is performed. This is the crux of PPBS. It involves (a) identification of the governmental objectives, (b) explicit, systematic identification of alternative ways of carrying out the objectives, (c) estimation of the total cost implications of each alternative, and (d) estimation of the expected results of each alternative.

The analysis process, however, should provide an academic decision-maker with a considerably improved understanding of the issues and the alternatives open to him; the resulting program plan and its implementing budget should thereby also be considerably improved.[19]

Arthur Smithies provides the following concise definition for PPBS:

> Planning, programming, and budgeting constitute the process by which objectives and resources, and the interrelations among them, are taken into account to achieve a coherent and comprehensive program of action for the government (campus or statewide system) as a whole. Program budgeting involves the use of budgeting techniques that facilitate explicit consideration of the pursuit of policy objectives in terms of their economic costs, both at the present time and in the future.[20]

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[19] For fuller discussion, see David Novick, Editor. *Program Budgeting: Program Analysis and the Federal Budget*, especially the chapter by Werner Z. Hirsch, "Education in the Program Budget," pp. 178-207.

See also, *Budgeting for National Objectives* prepared by the Committee for Economic Development, January, 1966.

[20] Arthur Smithies. "Conceptual Framework for the Program Budget," *Program Budgeting*, edited by David Novick, p. 24.

Implementing PPBS

The primary considerations involved in program budgeting can be summarized under three headings: (1) structural or format, (2) analytical process and (3) data or information systems.

The structural aspects of program budgeting are concerned with the establishment of a set of categories, usually from five to ten, which are oriented primarily toward the "end product" activities--the objectives and goals for the institution.

In other words, the process requires an identification of needs for the region or population served. The needs are long-range and are, so far as possible, put in quantified terms. For example, the need for middle management personnel in King County will increase ten per cent each year for the next five years and continue thereafter to increase at about 2.5 per cent for another fifteen years. This need is stated as a goal for a college. Next year's effort will become an objective. The total effort is found in the program structure.

More systematically the development is as follows:

I. *Needs.* Assessment of the needs for a protracted period of time in relation to an institution's ability to service.

II. *Planning Goals.* The specific end results expressed in planning that a college is expected to achieve usually over a multi-year period.

III. *Program Objective.* A statement of specific work to be undertaken for the first planning year of a college's multi-year plan to achieve a desired goal developed during the planning process.

IV. *Program Structure.* A series of out-put oriented categories which, when taken as a whole, encompass the total work of a college. The program structure is the means by which a college is able to classify all of its programs and

activities in a manner that will permit a ready determination of the total program commitment for which a college is responsible. The program structure serves as a basic framework for a college's management processes and for relating these processes to others.

Within a program structure are additional subdivisions:

A. *Program Category.* The primary or initial divisions of the program structure. It is a grouping of activities or operations that serve the same broad objective or mission, e.g., occupational education, adult education, transfer program, library, general administration, student personnel, auxiliary services.

B. *Program Subcategory.* A subdivision established within each program category, combining programs on the basis of narrower objectives contributing directly to the broad goal for the program category as a whole. A subcategory of the transfer program could be social sciences or humanities.

C. *Program Element.* Usually is a subdivision of a program subcategory and comprises the specific services that contribute to a college's goals. History and political science could be program elements under social sciences.

D. *Program Factor.* A measure of program output normally in terms of numbers of units produced or per cent of completion. The number of student credit hours taken in history or the number of certificates granted to students in the mid-management could be program factors.

The second primary consideration involved in program budgeting is the analytical process. This process pertains to various study activities conducted as an integral part of the system and within the framework mentioned above. The primary objective of this type of analytical effort is to systematically examine alternative courses of action in terms of utility and costs with a view to helping clarify the relevant choices open to the decision-makers.

The principal tools include the following:

I. *Program Memorandum.* An analytical planning document for a specific Program Category that presents, in summary fashion, an analysis of the most pressing educational problems facing an institution. The Program Memorandum addresses itself to a future time period of at least five years and gauges the impact of a proposed action over that time period. It is supported by a Program and Financial Plan.

II. *Program Strategy and Rationale.* A plan, method, or series of actions for obtaining a specific goal or result, with a fundamental reason for adopting such a plan.

III. *Resources Planning Schedules.* Schedules used to accumulate cost and production information on a combined appropriation structure and program structure basis. They provide information for the Program Memorandum, Program and Financial Plan and the appropriation process.

IV. *Planning Goals.* The specific end results expressed in planning that the organizations of a college are expected to achieve, usually over a period of years.

V. *Systems Analysis.* (Systems analysis will be more fully described in the next section.) One of the special features of program budgeting is that it forces the analysis of alternatives. Systems analysis is the means by which proposed alternatives can be examined. Specifically, it is the use of quantitative reasoning aided by modern analytical methods to help choose a policy or course of action from among competing alternatives.

The third primary consideration involved in program budgeting is the data or information systems. The information system must be able to generate the data which are needed to support the structural format and the analytical process. In addition, the information system should provide data for progress reporting and control so as to indicate how good or how poorly major program decisions are being carried out in the process of implementation. Likewise, the information system must provide data to serve as a basis for analytical process in making estimates of benefits and costs for future alternative courses of action.

Techniques for reporting progress are built into the Review and Analysis. Review and Analysis can be quarterly or in any other segment of time agreed upon. The process is used within the scheduled period of operation. For a longer look, which would carry policy implications, Special Studies are used. Each program category usually is subjected to a special study on a periodical basis. The study involves an intensive examination of the program category or any of its parts.

Williams predicted three major areas of concern in implementing PPBS in a College setting: (1) conceptual, (2) operational and (3) institutional.

Conceptual problems are those encountered in the design of a programming system and in relating that system to existing administrative requirements which are likely to be inherent in the income-expenditure analysis at colleges and universities.

Operational problems are those encountered in implementing a program system in the environment of some specific university. These problems are likely to be much more comprehensive in the initial phases of implementation, but they will endure to some extent because a programming system by definition is not a static and final set of techniques.

Institutional problems are those defenses thrown up by bureaucratic organizations when any change threatens the citadel of established decision-making procedure.[21]

In summary, Melvin Anshen states the philosophy of PPBS as follows:

> It is the essence of decision-making, therefore, to choose among alternative ends and to ration scarce means to their accomplishment. At this level of description, no significant distinction exists between profit and non-profit organizations, or between private and public organizations. All require the ordering of goals, the analysis of their relative contributions to the great aims of the total undertaking, the development of plans, the measurement of alternative resource inputs and their relation to progress toward objectives, rational choice of feasible ends, allocation of means, monitoring of progress and appraisal of results. The budget process is the activity through which this work is done. The budget is the instrument through which the process is made operational.[22]

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[21] Williams, *op. cit.*, pp. 52-53.

[22] Melvin Anshen. *The Federal Budget as an Instrument for Analysis, Planning, and Management.* p. 1.

II. SYSTEMS ANALYSIS

Introduction

One feature of program budgeting which its advocates praise highly is that it forces an examination of alternative means to reach goals. Systems analysis is the means by which the alternatives can be objectively analyzed. Alain C. Enthoven, Assistant Secretary of Defense for Systems Analysis, declared that systems analysis "is nothing more than quantitative or enlightened common sense aided by modern analytical methods."

Charles J. Hitch defined the term as follows:

> Systems analysis is simply a method to get before the decision-maker the relevant data, organized in a way most useful to him. It is no substitute for sound and experienced judgment, and it is but one of the many kinds of information needed by the decision-maker.[1]

There are many misconceptions about systems analysis (also called cost/benefit analysis, cost/utility analysis, cost/effectiveness analysis). To some the system is equated with magic and surrounded with mystery. It is not magical; it is not infallible. There need be no mystery about it. Another group fears that cost analysis will always recommend the cheapest alternative rather than the best. Whereas the former group displayed too much faith, the latter displayed too little. One of the basic features of the system is the development of criteria. The purpose of analysis is to meet the criteria at the least cost, which is not

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[1] Charles J. Hitch. *Decision-Making for Defense*, p. 53.

the same as the cheapest method. However, the concept has limitations. It is subject to bias. It can be improperly designed. Faulty data can be fed into the system. Yet, one must ask: What are the alternatives to analysis? (Parenthetically, one could note that a systems analysis could be done on the alternatives to analysis.) One alternative is pure intuition. Another is expert opinion. Still another is the committee system.

The Process of Analysis

One of the most lucid explanations of systems analysis is provided by Hitch and McKean (1960) in their book, *The Economics of Defense in the Nuclear Age.*[2] They describe the five elements of systems analysis: (1) Objective(s), (2) Alternatives, (3) Costs, (4) Model(s) and (5) A Criterion.

Since systems analysis is primarily a tool for decision-makers to be used in selecting a policy or course of action, the first task of the analyst is to ascertain what the objectives are. What goal is to be met? This is crucial; if wrongly made, the whole analysis can be addressed to the wrong problem.

The alternatives are the means by which it is hoped the objectives can be attained. Since each alternative is thought of as a system and each alternative is analyzed, one can see how the term "systems analysis" came into existence. One example can be used to illustrate the process. The objective could be to combat juvenile delinquency. The alternatives could include education, antipoverty measures, police protection, moral rearmament and slum clearance.

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[2] Charles J. Hitch and Roland N. McKean. *The Economics of Defense in the Nuclear Age*, pp. 118-120.

Having established the objective and having identified the alternatives, the next step is to ascertain the costs. Costs are the negative values in the analysis. Costs are usually stated in dollars, but they are resources which, if used in one manner, cannot be also used in another. Their true measure must be thought of as opportunities which are precluded. This structure can be seen as cost/benefit analysis.

Next comes the model. Models are abstract representations of reality. They help the analyst and the decision-maker to perceive significant relations in the real world, to change them and to base predictions on them. In systems analysis, the role of the model is to estimate for each alternative the costs that would be incurred and the extent to which the objectives would be attained. Put another way, the model permits the tracing of inputs and outputs so that the consequences of all the alternatives can be visualized.

Finally comes the application of the criterion, which is the standard by which the alternatives are ranked. It provides a means of weighing cost against effectiveness.

The positive values--the objectives--are weighed against the negative values--the resources used up.

Hitch and McKean conclude:

> Judgment is always of critical importance in designing the analysis, choosing the alternatives to be compared, and selecting the criterion. Except where there is a completely satisfactory one-dimensional measurable objective, judgment must supplement the quantitative analysis before a choice can be recommended.[3]

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[3] *Ibid.*, p. 120.

J. D. McCullough provides a list of six features which are characteristic of systems analysis:

1. End-product orientation
2. Extended time horizon
3. Incremental costing
4. Life cycle costs
5. Dollars as the measure of resources
6. Analytical approach and statistical techniques[4]

The Political Realm

There is an inherent conflict between the systems analysis of PPBS and the world of politics. J. R. Schlesinger observes that:

> The pride of systems analysis is its ability to take a long run view and to disregard prior commitments, if they are too costly or non-productive.
>
> By contrast, in politics, one is concerned with more than the substantive costs and benefits involved in a specific decision area. One is engaged in mobilizing support by words and by action over a wide range of ill-defined issues. The ultimate criterion will remain the psychological and voting responses of the general electorate and of important pressure groups. Positive responses in this realm are only irregularly correlated with those actions preferred on the basis of cost-benefit criteria. The focus of political action tends to be short run.[5]

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[4] J. D. McCullough. *Cost Analysis for Planning-Programming-Budgeting Cost-Benefit Studies*, p. 10.

[5] J. R. Schlesinger. *Systems Analysis and the Political Process* (Santa Monica, The RAND Corporation, 1967), p. 7.

More pointedly Schlesinger says that the process of PPBS "cannot transmute the dross of politics into the fine gold of Platonic decision-making... . Political decisions in a democratic society can hardly be more 'rational' than the public, the ultimate sovereign, is willing to tolerate."[6]

Despite these "political" reservations, three states--California, New York, and Wisconsin--and two cities--Detroit and New York--have begun installing PPBS into their governmental processes. Surely more will follow. The work of the State-Local Finances Project at the George Washington University is working with five states, five counties and five cities in a pilot program. The project has already drawn one clear conclusion: "As PPBS is primarily a tool for high level decision making, it will not be worthwhile unless the high level management understands it, wants it, and uses it."[7]

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[6] *Ibid.*, p. 29.

[7] Harry P. Hatry and John F. Cotton. *Program Planning for State, City, and County Objectives*, p. 35.

III. CPM/PERT

Introduction

Many activities on a campus today are exceedingly complex. They reflect elaborate networks and require a careful ordering of the multitude of activities if a schedule is to be met. Planning and constructing a campus is one illustration of a complex activity which represents a very elaborate network of events. A schedule must be developed which will tie all the events together into a network so that the sequence, time and place are known. Program Evaluation and Review Technique (PERT) has been developed as a means of ordering potential chaos.

The use of PERT in construction is now commonplace, but it has many other uses. Evergreen State College has set up the process for selecting its first president by using a simplified PERT chart to reflect the number, sequence and time for all the activities involved in the selection. There are many other campus programs to which PERT could be applied--catalog preparation, registration, employment, budget preparation, etc.

For supernetworks a computer is essential; however, in many routine applications of PERT no hardware is required. Often in supernetworks 30,000 or more activities will be scheduled. In fact, PERT was developed to coordinate the several thousand activities required in the Navy's Polaris missile project and is credited with helping to complete the project about two years ahead of schedule. This is all the more significant when one realizes that the history of such projects indicates that completion dates are often extended considerably. The two primary features of the technique are: (1) they provide a schedule so that

the administrator can know at all times whether the project is on schedule and what steps can be taken if the project falls behind schedule and (2) there is a potential saving of large sums of money when the contractor or other producers are forced to plan and schedule the activities.

Defining CPM/PERT

The Critical Path Method and Program Evaluation and Review Technique are terms which refer to techniques of systemitizing the planning, scheduling, controlling and evaluating phases of project management. As program budgeting brought the planners and the budgeters together so CPM/PERT brings together the project engineer and the manager. PERT was developed by the Navy, as noted above. The Critical Path Method is a modification developed by Univac. It is a network planning system employing a single activity-time duration estimate; the irreducible path length is termed the "critical path", and it represents the shortest possible completion time according to the planned approach.

As with most concepts, this one did not develop in isolation. The history is interesting and includes contributions from Frederick W. Taylor, Henry Gantt (the Gantt Chart), George Fouch (the Line of Balance), the Navy's Milestone Method, Polaris, Univac. There are certain to be other refinements, for the process seems to be evolutionary.

Using PERT

PERT, unlike CPM, may use multiple time estimates. CPM uses a single time estimate, the "most likely" time estimate between events. The most likely time estimate is defined as that time in which an activity can be completed, all factors taken into consideration. PERT, if multiple time estimates are used,

employs three estimates: optimistic, most likely and pessimistic. The "expected" time is then mathematically computed by a simple formula.

As with systems analysis, the first glance at a complicated network forces one to conclude that the technique must be extremely complicated. Actually, the technique is not complicated, especially for the manager, who needs to read the progress results. The descriptions are difficult; however, a few hours with one of several good books would provide valuable dividends. Most important for the college administrator is the need to remember that CPM/PERT is only an information-generating process performed in a systematic and relatively uncomplicated manner. It incorporates the engineering and management experience and knowledge.

The advantages are listed below:

1. Planning and scheduling tend to become more disciplined than in earlier systems.
2. The magnitude of the project receives better definition.
3. The separation of planning, scheduling, controlling and monitoring is possible.
4. The critical areas can be identified.
5. The graphical presentation of the arrow diagram allows visual, constructive criticism.
6. Management "by exception" reduces managerial effort for a project to between 15 per cent and 20 per cent of the total project.
7. Coordination and communication improve all levels of the project.
8. Planners and schedulers become more competent in their skills.
9. Time forecasts can be made more accurately.
10. Planning can allow for outside effects (contingencies such as adverse weather and labor disputes).

11. Management acquires a useful device for measuring the ability of the planner.[1]

Desmond Cook provides a helpful checklist for the implementation of PERT.[2]

CHECKLIST FOR PERT IMPLEMENTATION

1. Organizing for PERT Implementation
   - A. Prepare policy statement on management support and participation.
   - B. Assignment of organizational responsibilities for PERT implementation and operation.
   - C. Secure PERT guidance documents.
   - D. Develop PERT implementation plan.
   - E. Prepare procedures handbook for PERT implementation to include such topics as:
     1. Methods of preparing and transmitting input data during the original PERT application.
     2. Methods for providing updating information as a result of computer processing or hand calculations.
     3. Distribution system for output data and reports to persons having decision-making authority.
     4. Types of management reports to be employed.
     5. Establish frequency of reporting.

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[1] See Norton E. Marks, *et al.* *CPM/PERT: A Diagrammatic Scheduling Procedure*, pp. 71-72.

See also Desmond L. Cook. *Program Evaluation and Review Technique: Applications in Education* and Robert W. Miller. *Schedule, Cost, and Profit Central with PERT.*

[2] Cook. *op. cit.*, pp. 84-86.

6. System for network preparation including event numbering, standard activity descriptions, and designation of milestones.

7. Data input and output formats (depending on computer used) to be employed.

F. Conduct PERT training.

II. Operational Considerations

A. Work Breakdown Structure

1. Develop work breakdown structure consistent with project proposal.

2. Check to insure compatibility of work breakdown structure with proposal and contract items.

3. Check end item subdivisions to insure coverage of all work contained in the summary item from which developed.

4. Establish compatibility between work breakdown structure and the project organization.

5. Assign organizational responsibility for work packages.

6. Check to be sure work packages have well defined start and end points.

B. Establish Network

1. Develop master network to show general project plan.

2. Develop detailed network and subnetworks based upon the master network and project work breakdown structure.

3. Check events for uniqueness (i.e., occurring only once).

4. Check network for possible "loops".

5. Select project milestone events.

6. Identify interface events.

7. Check logic of final project network plan.

8. Adopt event numbering system (sequential or random depending on computer program to be used).

9. Secure time estimates for network activities.

C. Process Network Data

1. Enter directed date on network.

2. Transpose network event and activity date to keypunch input forms.

3. Audit input forms against network for completeness and accuracy.

4. Keypunch and verify PERT data.

5. Process data.

D. Analysis and Replan

1. Analyze computer output reports to note probability and slack conditions (i.e., problem areas).

2. Verify reasonableness of problem by use of cross checks to locate errors in input and processing.

3. Analyze critical and limit path to determine nature of constraints.

4. Discuss possible problem areas with responsible organization or personnel for proposed solutions.

5. Document proposed solutions and prepare for reprocessing.

6. Correct networks and reprocess data.

7. Establish Internal Schedule Dates, Consistent Directed Schedule Dates and Latest Allowable Dates.

8. Prepare reports and displays for management.

E. Update System

1. Note completion dates for work elements accomplished.

2. Secure time estimates for work elements in process.

3. Review and secure, as needed, time estimates for work elements yet to be initiated.

4. Incorporate management decisions into work breakdown structure and network.
5. Process data.

Even a quick glance at the checklist above will show that the college administration would have an active and decision-making role in any project in which PERT is employed. However, the success of PERT depends more on decisions external to the network than to those internal to the network. The first--and most important--decision in the successful utilization of PERT is a firm decision to use PERT for planning and control of the *entire* project. To put the issue differently, it is worse to use PERT as a supplementary tool of planning and control than it is not to use it at all.

IV. THE DELPHI TECHNIQUE

Planning horizons are being extended. As noted, the planning phase of PPBS extends 20 years or more. Many statistics are available. Colleges, for example, can predict with some accuracy enrollments to 1980, staff needs, physical facilities. More difficult are matters of judgment. What should be the limit of the enrollment? When should a second campus be started? What programs should be introduced? Something better than haphazard intuitive gambles are needed as a basis for planning. Educators cannot be fatalistic about the future, and they need not be.

The future need not be viewed as unique, unforseeable and inevitable. It is, in fact, rather exciting to think that there may be several futures--alternative futures. Speculation on the future is no longer in the tradition of H. G. Wells or even George Orwell. Daniel Bell is completing a book on the post-industrial society. Herman Kahn and Anthony Wiener published a book last year entitled *The Year 2000*. Futuristic study is quite popular. For educators, speculation about the future is not a parlor game; it is a hard, practical problem which needs clarification and decision now. One recent technique which could be of help to policy-makers is the Delphi technique.

"The Delphi technique is a method for the systematic solicitation and collation of expert opinions," says Olaf Helmer. "It is applicable whenever policies and plans have to be based on informed judgment, and thus to some extent to virtually any decision-making process"[1]

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[1] Olaf Helmer. *The Use of the Delphi Technique in Problems of Educational Innovations*, p. 1.

As with CPM/PERT, systems analysis and program budgeting, the origin and impetus came largely from research conducted for the military. Olaf Helmer of the RAND Corporation developed the technique in the early 1950's. It was "declassified" about five years ago.

The Delphi technique eliminates committee activity among experts. In its place is a carefully designed program of sequential individual interrogations, usually by questionnaires, interspersed with information and opinion feedback. Pfeiffer outlines the technique as follows:

1) The first questionnaire may call for a list of opinions involving experienced judgment, say a list of predictions or recommended activities.

2) On the second round each expert receives a copy of the list and is asked to rate or evaluate each item by some such criterion as importance, probability of success, and so on.

3) The third questionnaire includes the list and the ratings, indicates the consensus, if any, and in effect asks the experts either to revise their opinion or else to specify their reasons for remaining outside the consensus.

4) The fourth questionnaire includes lists, ratings, the consensus, and minority opinions. It provides a final chance for the revision of opinions.[2]

Generally, a consensus develops as the result of the convergence of opinions. Yet no meetings are held. No personalities are involved.

In some cases, there is no consensus. Opinion then tends to polarize at the extremes beyond the range within the 25 per cent and 75 per cent quartiles

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[2] John Pfeiffer. *New Look at Education*, pp. 152-153.

around two distinct but opposing values. Even this consequence is of value to the decision-maker.

The report of one pilot project might illustrate the potential of the Delphi technique. Three groups of educators participated in the experiment, which was related to educational innovations. All 50 participants were specialists.

First, suggestions were obtained for specific educational innovations. These were edited and classified before being listed on the second questionnaire.

Second, the respondents were asked to evaluate the innovations listed in terms of importance, desirability and feasibility. Additions were accepted. Finally a list of 93 distinct proposals was compiled. These were grouped under several headings:

A.	Increase in student participation	7 proposals
B.	Educational R + D	10
C.	Model facilities	4
D.	Administration of school system	12
E.	Internal administration of schools	5
F.	Professional staff	18
G.	Costly new equipment	3
H.	Reorganization of instruction	22
I.	Adult retraining	4
J.	Education in the home	5
K.	Education of the deprived	3

A subgroup assigned the items to gross cost categories: F (essentially free); L (low cost); M (medium cost); and H (high cost). All projected cost estimates were for five years.

Third, a questionnaire asked the group to allocate a fictitious five-year budget of ten billion dollars among the proposed innovations. Subgroups were asked to allocate nine billion dollars among high-cost items, 990 million

dollars among medium-cost items, 90 million dollars among low-cost items and ten million dollars among essentially free items. Thirteen items were selected for funds by the high-cost subgroup. Highest allocations went to raising teachers' salaries and starting public school below age five. Eighty-five items were supported financially to some degree. The full ten billion dollars was allocated on a priority basis determined by experts without face-to-face contact.[3]

Helmer summarized the features of the final consensus:

1) The largest single item was $3 billion to raise teachers' salaries.
2) The two next largest items totalled $1.65 billion and were aimed at increasing student participation--encouraging life-long education by awarding grants to promising adults for educational leaves, and providing public school education for children under five years old.
3) In general, experiments with teaching machines, developing measures of teaching ability and the effectiveness of innovations, and other exploratory studies, received large-scale support.
4) Costly new equipment, including audiovisual material available for individual use and computerized libraries, were allotted some $700 million--"not nearly as large a share as it might have absorbed, possibly reflecting the opinion that more experimental work should precede large-scale adoption of new devices."
5) The category "reorganization of instruction and programs" included twenty-two separate proposals, and practically all of them received budgetary support.
6) All three groups (the experiment included three groups of experts) rejected five high cost proposals: subsidizing private schools, subsidizing on-the-job industrial training, reversing the trend toward

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[3] A full report of the experiment can be found in *Inventing Education for the Future* edited by Werner Z. Hirsch (1967).

larger schools, providing full pay sabbaticals to teachers, and increasing the salaries of high school teachers to college level.[4]

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[4] Helmer, *op. cit.*, pp. 21-22.

ANNOTATED BIBLIOGRAPHY

Introduction

The bibliography provided below is not intended to be complete or exhaustive. Changes relative to such new techniques as program budgeting, CPM/PERT, systems analysis and the Delphi method are rapid. However, it is hoped that the best available introductory material is listed.

Following each entry is a letter in parenthesis. The letter is intended to designate the level of difficulty and the general focus of the entry. Below is an explanation:

(A) Introductory/PPBS
(B) General Treatment
(C) Application to Education
(D) Technical Treatment

For example, under BOOKS, the first entry is Cook. This book provides a technical treatment with application to education as indicated by the designations (C) (D).

Under the section on REPORTS, can be found several entries from the RAND Corporation. The RAND *Corporation is a "think tank" in Santa Monica, California,* with a large staff of researchers from almost every academic discipline. It is an independent, non-profit organization engaged in scientific research and analysis, primarily for governmental agencies.

A list of reports is included in *Selected RAND Abstracts*, which is issued quarterly (March, June, September and December). Annual subscriptions are

available without charge to academic and public libraries. Over one hundred libraries are depositories for all unclassified publications. The University of Washington and since 1967, Washington State University, are depositories. Publications are available on Interlibrary loan and all libraries are authorized to reproduce materials. Materials may be purchased directly. The address is: The RAND Corporation, 1700 Main Street, Santa Monica, California 90406.

I. BIBLIOGRAPHIES

Don Vito, P. A. *Annotated Bibliography on Systems Cost Analysis.* The RAND Corporation, RM-4848-1-PR, March 1967.

This is a rather complete bibliography prepared for the United States Air Force.

Section III is concerned with program budgeting. Most of the listings are technical and/or difficult to locate as they relate to military operations.

U. S. Bureau of the Budget Library. *Program Analysis Techniques: A Selected Bibliography* (Revised). Washington, D. C., 1966.

A bibliography for the advanced student covering eleven major areas from Health, Education and Welfare to Transportation.

U. S. Library of Congress. Legislative References Service. *The Planning-Programming-Budgeting System: An Annotated Bibliography,* by Robert L. Chartrand and Dennis W. Brezma. April 11, 1967, Washington, D. C.

An extension of an earlier bibliography. Contains relatively few entries but provides, in most cases, rather complete notations. Selections would be good for general use. Most technical works are omitted.

II. BOOKS

Cook, Desmond L. *Program Evaluation and Review Technique: Applications in Education.* (Cooperative Research Monograph No. 17, Office of Education, U. S. Department of Health, Education and Welfare.) Washington: 1966.
(C) (D)

Cook, of Ohio State University, has prepared a primer for educators on PERT. Chapter II provides, in elementary terms, the characteristics of a PERT network. Later he provides applications to educational problems. Bibliography included.

Culbertson, Jack. "State Planning for Education" in *Planning and Effecting Needed Changes in Education*. Designing Education for the Future, No. 3, edited by Edgar L. Morphet and Charles O. Ryan. New York: Citation Press, 1967, pp. 266-285. (C)

An article written by an educator for educators. It provides a general view of the importance of planning under state leadership while introducing PPBS and Operations Research.

This is an excellent introductory article to the whole subject of planning.

References in the footnotes provide good suggestions for additional reading.

Dorfman, Robert (ed.). *Measuring Benefits of Government Investments*. (Papers presented at a conference of experts held November 7-9, 1963). Washington: the Brookings Institute, 1965. (D)

The introduction contains remarks by the editor which set the stage for measuring cost/benefit. One section is devoted to the topic "Preventing High School Dropouts" by Burton Weisbrod. Much of the book, as might be expected, is quite technical as one expert talks to another.

Eckstein, Otto. *Public Finance*. 2nd Edition. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967. (B)

An excellent, general treatment of the issues related to public finance by a recognized authority. "A fifth of the nation's output is allocated, not by individual choices in markets, but by public decision-making." Chapter two discusses the budget process and cost/analysis.

Helmer, Olaf. *Social Technology*. New York: Basic Books, Inc., 1966. (D)

Helmer has, in *Social Technology*, expanded on his work to date relating to the "Delphi" method of reaching expert consensus. Emphasis is on the social technology of "inventing the future". Much of the pioneer work reported in this short book was done at the RAND Corporation where Helmer has been working since 1946.

Hitch, Charles J. *Decision-Making for Defense*. Berkeley: University of California Press, 1966. (A)

Charles J. Hitch, now President of the University of California, was the Comptroller for the Department of Defense under Robert S. McNamara when PPBS was installed in 1961. With Roland N. McKean, he authored *The Economics of Defense in the Nuclear Age*, published in 1960, ten months before McNamara asked him to join DOD. The basic work was the result of several years of study conducted by the RAND Corporation, including David Novick's *Efficiency and Economy in Government* (1954).

Decision-Making for Defense is the book version of the H. Rowan Gaither lectures in Systems Science delivered by Hitch in 1965. Chapter II is entitled "Planning-Programming-Budgeting"--a first-hand account of the introduction of PPBS to the DOD.

Chapter III, "Cost-Effectiveness" describes the use of systems analysis to alternative ways of reaching national security objectives.

The first and fourth lectures (chapters) represent a preview or overview and retrospection or prospect.

_____ and Roland N. McKean. *The Economics of Defense in the Nuclear Age*. Cambridge: Harvard University Press, 1960. (Reprinted by Athereum, 1965.) (D)

This is the book which Hanson W. Baldwin called "The Bible of the Pentagon." McNamara selected Hitch as Comptroller of the DOD based on this work and the earlier efforts by the RAND Corporation. Subsequently, President Johnson made his August 25, 1965 pronouncement about "a very new and very revolutionary system" (PPBS) which was to be employed throughout the Federal government. In addition to what this basic book contributes to an understanding of program budgeting, it also introduces the reader to systems analysis. The process is simply outlined in Chapter 7 under the subheading "The Elements of an Economic Analysis," pp. 118-120.

The bibliography is rather thorough, but most references are technical and all references are to works prior to 1960.

Lyden, Fremont J. and Ernest G. Miller (eds.). *Planning-Programming-Budgeting: A Systems Approach to Management.* Chicago: Marham Publishing Company, 1967. (A) (B)

The editors are on the faculty of the Graduate School of Public Affairs, University of Washington. Included are nineteen articles covering a period of fifteen years (1952-67). Many of the articles have appeared in *The Public Interest* or *Public Administration Review.*

Articles are grouped under six headings: PPB in Perspective, Budgeting and the Political Process, Approaches to Planning and Program Budgeting, the PPB Approach to Budgeting, The Systems Base of PPB and the Application and Critique of PPB. Also included in the Appendix are the familiar Bulletin No. 66-3, Supplement to Bulletin No. 66-3 and Bulletin 68-2 published by the United States Bureau of the Budget.

Marks, Norton E., H. Lyndon Taylor, Gary W. Schoen and Jeffrey C. Susbauer. *CPM/PERT: A Diagrammatic Scheduling Procedure.* (A publication of the Bureau of Business Research, Graduate School of Business, the University of Texas.) Austin: 1966. (D)

With Cook and Miller, this booklet would provide a good introduction to the Critical Path Method and PERT. Of particular interest, is the application of the techniques to construction.

Miller, Robert W. *Schedule, Cost, and Profit Control with PERT.* New York: McGraw-Hill Book Co., 1968.

This is one of the better written textbooks on PERT. It would be a good follow-up to Cook. (See Cook above) PERT has become standard practice in the construction industry, and the Federal government requires all contractors to PERT their schedules. State University of New York planners not only require critical-path schedules from contractors bidding for new jobs but also hold special meetings before hand to describe the new methods.

PERT was developed to coordinate the several thousand activities required in the Navy's Polaris missile project and is credited with helping to complete the project two years ahead of time.

Novick, David (ed.). *Program Budgeting: Program Analysis and the Federal Budget.* Cambridge: Harvard University Press, 1965. (A) (B)

This book is a collection of essays--many of them reprints of papers prepared by the RAND Corporation. There are 12 chapters divided into three parts: Government Decision-making and the Program Budget, Actual and Potential Applications of the Program Budget Idea and Implementation and Operation.

Most of the authors are pioneers in the field: Novick, Arthur Smithies, Gene H. Fisher, Werner Z. Hirsch, Melvin Anshen and Roland N. McKean.

Fischer has contributed a chapter on the role of cost/utility analysis (another term for systems analysis) in PPBS. Werner Z. Hirsch has a chapter entitled "Education in the Program Budget" (Chapter 7). Also of particular significance is the chapter by George A. Steiner on the problems of implementing PPBS.

Well documented but no bibliography.

Pfeiffer, John. *New Look at Education: Systems Analysis in our Schools and Colleges.* New York: The Odyssey Press, 1968. (C)

This brief and inexpensive book ($1 per copy) is something less than "comprehensive and comprehensible" as Henry Chauncy describes it in the "Foreword"; but it is short, recent and introductory--the best present single source for an overall view of a systems approach to education.

Little emphasis is given to program budgeting. More emphasis is given to systems analysis. Much is covered but little in depth. Especially valuable are chapters 2, 5, 6 and 7. Chapter 6 deals with university research, including a discussion of the simulation model known as CAMPUS, now in operation at the University of Toronto.

Also touched on briefly in the last chapter is a section on the Delphi method.

Theil, Henri, John C. G. Boot and Teun Klock. *Operations Research and Quantitative Economics: An Elementary Introduction.* New York: McGraw-Hill Company, 1965. (D)

While the subtitle announces that the book is an elementary introduction, it is somewhat puzzling to the educator. Introductions are made to most of the management techniques now practiced; linear programming, optimum path (CPM and PERT), game theory, simulation and input-output analysis.

Wildavsky, Aaron. *The Politics of the Budgetary Process.* Boston: Little, Brown and Company, 1964. (B)

The budget of the United States must be approved by the Congress of the United States; it must be prepared and presented to the Congress by the President of the United States. Both the budget and the budgetary process are products of the political process. Professor Wildavsky analyzes the politics of the budgetary process.

Brief mention is made of program budgeting (pp. 135ff.), but the concept was in its infancy at the time the book was written.

Williams, Harry. *Planning for Effective Resource Allocation in Universities.* Washington, D. C.: American Council on Educa[illegible], 1966. (C)

The author is experienced in budgeting and systems analysis as a result of his work on economic studies for the Institute for Defense Analysis. This booklet (78 pp.) was prepared for the Commission on Administrative Affairs of the American Council on Education.

Emphasis is placed on the fact that program budgeting is an approach, not a formula. This publication attempts to relate program budgeting to university setting.

III. REPORTS

Burkhead, Jesse. "The Theory and Application of Program Budgeting to Education," *Trends in Financing Public Education.* (Proceedings of the Eighth National Conference on School Finance, NEA Committee on Educational Finance.) Washington: The National Education Association of the United States, 1965. (C)

Burkhead traces recent developments in program budgeting, provides a conceptual framework and suggests applications to public education. He argues that program budgeting should *not* be introduced as a control decree but rather as a system for evaluation. (In the same proceedings, are reports of progress with program budgeting in the Chicago and Memphis schools. Both experiences reflect greater visibility of program.)

Committee for Economic Development. *Budgeting for National Objectives.* January, 1966, 65 pp.

A policy statement by the CED Committee for the Improvement of Management in Government. The budget is seen in two parts: as a focus for national policy decisions and as a tool for effective management.

A need is seen for a continuous unified system of planning, programming and budgeting. The system as used in DOD is examined and a recommendation is made to extend the concepts of PPBS throughout the government. (President Johnson issued such an order on August 25, 1965.)

A recommendation is made for the intensive use of cost/benefit studies.

Fisher, G. H. *The World of Program Budgeting.* The RAND Corporation, P-3361, May 1966, 30 pp. (A)

A general discussion of PPBS. The elements of the system are described, including its basic objectives, the development of alternatives, extended time horizon and costs.

Cost utility analysis is described as an approach in aiding decision-making. Several examples are presented.

Helmer, Olaf. *Analysis of the Future: The Delphi Method.* The RAND Corporation, P-3558, March 1967, 11 pp. (B)

Helmer expands upon his earlier writings on the Delphi Method. He contends that the "soft" ware sciences are about to make a dramatic breakthrough and that the Delphi method may be one means of getting to the breakthrough. Subjective opinion which is tested for consensus is needed in all decisions where objective measures are not absolute. Included in this category would be all social cost/benefit studies.

Helmer, Olaf. *The Use of the Delphi Technique in Problems of Educational Innovations.* The RAND Corporation, P-3499, December 1966, 22 pp. (B) (C)

The Delphi Technique is a method for the systematic solicitation and collation of expert opinions. It is intended to avoid personality pressures and related complications and to get at expert opinion without bringing the experts together face-to-face.

Helmer illustrates the method in operation by applying it to the problem of educational innovations.

The importance of the technique to PPBS is that it is a means by which human judgment can be utilized as well as quantitative measures.

Hirsch, Werner Z. *Integrating View of Federal Program Budgeting.* The RAND Corporation, RM-4799-RC, December 1965, 27 pp. (B)

Hirsch has tried to prepare a follow-up to the Novick book (see above) by suggesting an integrated view to Federal budgeting. He suggests five major decision areas: maintenance of national security, maintenance of law and order, social development, economic development and general government operations. He applies this structure to the budget for FY 1965. One decision area, for example, is social development, which includes health, welfare, education and urban housing and community development programs. Cost for FY 1965 was $32 billion.

Hirsch addresses himself to the problems of planning, appropriations, administration and control.

Klein, Burton H. *Public Administration and the Contemporary Economic Revolution.* The RAND Corporation, P-3586, March 1967, 15 pp. (B)

Klein traces the development of the "new economics" as an example of the lag between economic theory and political practices based on economic theory. He then projects the same lag to systems analysis and political decisions. Conflicts must result.

McCullough, J. D. *Cost Analysis for Planning-Programming-Budgeting Cost Benefit Studies.* The RAND Corporation, P-3479, November 1966, 63 pp. (B)

Includes a general discussion of the role of cost analysis in cost/effectiveness studies. Cost/effectiveness is seen as a tool for long-range planning.

Education is used as an illustration.

A list of references is included.

McGown, Wayne F. "How to Apply Programming-Planning-Budgeting to your State," A Report Prepared for the National Conference of State Legislators, Washington, D. C., 1966. (B)

The author is director, Bureau of Management, Department of Administration, State of Wisconsin. His report on the installation of PPBS in the State of Wisconsin is optimistic. He found the system especially helpful to the legislature in considering educational programs.

Novick, David. *Program Budgeting in the Department of Defense.* The RAND Corporation, RM-4210-1-RC, September 1964, 29 pp. (A)

Discusses the introduction and development of the concept in DOD. Stresses the role of the decision-maker.

Planning is considered in long-range terms. The annual budget is a part of the long-range plan. Outlines the application of program change proposals used to keep the budget (the Program and Financial Plan) addressed to current issues and needs.

Presidential Task Force on Career Advancement. *Investment for Tomorrow.* A Report to the President of the United States. Washington, 1967. (B)

President Johnson assigned a special task force to make recommendations on post-entry training and education for the 760,000 Federal professional, administrative and technical employees. Chapter 9 outlines PPBS and points out the need for new professional personnel. The system will require a large number of specialized personnel.

Quade, E. S. *Cost-Effectiveness: Some Trends in Analysis.* The RAND Corporation, P-3529, March 1967. (B)

In this paper, Quade moves away from a concentration on the mathematical aspects of analysis to emphasize the "judgmental" aspect of analysis. Computers of today are frail tools when compared to the computers of the future. Judgment by experts must make similar strides. Quade discusses the Delphi method of using expert judgment in reaching a consensus. Examples are provided.

_____. *Systems Analysis Techniques for Planning-Programming-Budgeting.* The RAND Corporation, P-3322, March 1966. (B)

Quade's paper is an excellent introduction to systems analysis. It provides a detailed definition, an outline of the process, and a theoretical application. The five steps of analysis are discussed: (1) decision-maker's objectives, (2) alternatives, (3) costs, (4) model and (5) criterion.

Also discussed are the limitations of systems analysis.

Schlesinger, James R. *On Relating Non-Technical Elements to Systems Studies.* The RAND Corporation, P-3545, February 1967, 34 pp. (B)

With low level decisions, orthodox methods of systems analysis work quite well. The higher the level of decision the greater the risk in applying systems analysis. Excellent studies involving the total society could result in misleading policy decision-making. The implications should not be made that technical information is not needed. There remains a need for judgment by decision-makers.

_____. *Systems Analysis and the Political Process.* The RAND Corporation, P-3464, June 1967, 31 pp. (B)

The author is concerned with systems analysis at the practical level--the political level--rather than at the abstract level. In the abstract systems, the analysis is good, but it, too, has built-in bias, inadequate information bases, possibly erratic methodology. Finally, systems analysis needs to reckon with the political world.

The higher the order of decision to be made the lower are the chances that adequate information can be provided the decision-maker by the systems analysts.

State-Local Finances Project of the George Washington University. *Planning-Programming-Budgeting for City, State, County Objectives.* Selma J. Mushkin, Director. (A) (B)

This project, supported in part by the Ford Foundation, is a 5x5x5 design: five cities, five counties and five states. Can PPBS be adapted to state and local governmental fiscal problems? To date there have been some introductory materials and eight publications under notes, e.g., "PPB Note 1."

Harry P. Hatry and John F. Cotton did a general introduction in a booklet "Program Planning for State, County, City." Part One deals with the considerations in instituting a PPBS System. Part Two illustrates the application of systems analysis to PPBS. A brief bibliography is included.

The notes included the following:

Note 1: "Is an Integrated Planning-Programming-Budgeting System Useful for Our Jurisdiction?"

Note 2: "Administrative Framework for Establishing Planning-Programming-Budgeting Systems in States, Cities and Counties."

Note 3: "Development of Initial Instructions to Inaugurate a Planning-Programming-Budgeting System."

Note 4: "Staffing and Training for a PPB System in State and Local Governments."

Note 5: "Developing an Objective Oriented Governmental Program Structure."

Note 6: "The Role and Nature of Cost Analysis in a PPBS System."

Note 7: "Output Measures for a Multi-year Program and Financial Plan."

Note 8: "The Multi-year Program and Financial Plan."

Most of the notes conclude with a brief bibliography.

IV. PERIODICALS

Banks, Robert L. and Arnold Kotz. "The Programs Budget and the Interest Rate for Public Investment," *Public Administration Review,* XXVI: 4 (December 1966), 283-292. (D)

The authors have introduced a rather technical aspect of PPBS, the calculation of interest rates for prolonged periods of time. What standards should planners use in systems analysis applications to alternatives?

Dilley, Frank B. "Program Budgeting in the University Setting," *The Educational Record,* 47: 4 (Fall, 1966), 474-489. (C)

The author is not an economist. In fact, he is a professor of philosophy. The article grew out of Dilley's experience as an academic intern at the University of Denver (1965-66). The emphasis is not on budgeting but rather on planning. College administrators would appreciate this calm, dispassionate presentation of the advantages, methods and difficulties encountered in program budgeting.

Drew, Elizabeth B. "HEW Grapples with PPBS," *The Public Interest,* No. 8 (Summer 1967), 9-29.

Drew has taken one agency (HEW) which has taken PPBS seriously and has traced the first year of experience. Gardner and William Gorham took PPBS seriously. (Drew observes: "How well PPBS has worked, agency by agency, has depended more than anything on how seriously the man at the top has taken it... .")

During the first year, Gorham and his staff selected five areas for study: disease control, human investment programs (vocational rehabilitation, adult basic education, etc.), maternal and child care, improving income maintenance, and comparing programs to aid higher education. Four were completed. The last--higher education--"foundered on an astonishing lack of basic information." Following a short introductory section, the article is devoted to an explanation of the four completed studies.

Dror, Yehezkel. "The Planning Process: A Facet Design," *International Review of Administrative Sciences*, XXIX: 1 (January 1963), 46-58. (D)

Professor Dror provides a philosophical setting for the planning process:

A. The general environment of the planning process.

B. The subject-matter of the planning process.

C. The planning unit.

D. The form of the plan to be arrived at.

_____. "Policy Analysts: A New Professional Role in Government Service," *Public Administration Review*, XXVII: 3 (September 1967), 197-203. (B)

The author argues that policy analysis should become a new professional role in government, operating within the political and organizational setting as a new component which contributes to aggregate policy-making without preempting in any way the functions of the politicians and line executives.

Under PPBS, where decision-making based on analysis is stressed, the need is more clearly perceived. Policy analysis is needed more than systems analysis.

Furno, Orlando F. "Program Budgeting and School Quality," *AEDS Monitor*, V: 9 (April 1967), 13-16. (C)

The author, director of research for the Baltimore City Public Schools, observes that program budgeting becomes significant when goals and objectives are clear. It offers no panacea to the financial woes of education. Its paramount value is that it stresses the importance of goals and provides visibility to the programs designed to achieve the goals.

Gorman, William. "Notes of a Practitioner," *The Public Interest*, No. 8 (Summer 1967), 3-8. (B)

The author, Assistant Secretary for the Program Coordination, HEW, introduced PPBS into his department. His main purpose is to ease concerns about the analytical emphasis which seems to many to be replacing judgments.

First, analytical studies are still primitive. Second, there can be no substitute for judgment. He relates in a first-hand manner the problems and the hopes of PPBS in HEW.

Greenhouse, Samuel M. "The Planning-Programming-Budgeting System: Rationale, Language, and Idea-Relationship," *Public Administration Review*, XXVI: 4 (December 1966), 271-277. (B)

One of the better articles from the point of view of a practitioner. His concern is with identifying objectives, programs, alternatives, output, measurement, input and systems analysis. He defines each term operationally.

Held, Virginia. "PPBS Comes to Washington," *The Public Interest*, No. 4 (Summer 1966), 102-115.

A popular article reflecting the role of PPBS in the various departments following President Johnson's August 25, 1965 directive. She also provides a review of the theory by relating current practices to earlier writings, *viz.*, Novick, Hitch, McKean, Dorfman and Eckstein.

She concludes that analyses will become powerful weapons in persuasion.

Hirsch, Werner Z. "Toward Federal Program Budgeting," *Public Administration Review*, XXVI: 4 (December 1966), 259-269. (B)

Professor Hirsch's thesis is that program budgeting will improve operations and decisions in the Federal government by more clearly defining goals and objectives, by more fully studying alternatives, and by more quickly identifying problem areas.

One of the specific cases he discusses is education. (See pp. 265-266.)

Hollister, Jr., Robinson G. "A Decision-Making Budget," *The Educational Record*, 47: 4 (Fall 1966), 490-497. (C)

The author provides a careful argument for using the budget as a means for making decisions rather than having decisions made by the budget. Emphasis is placed upon a full examination of alternatives within budget preparation.

Advantages and limitations are discussed with the advantages outweighing limitations.

McCreary, Edward A. "That New Federal Budgeting System," *Think*, 32: 2 (March-April 1966), 26-29. (A)

Traces the development of PPBS in the DOD in a general, journalistic manner. Then the author raises the question: Can PPBS be transferred to other agencies? His answer, based on interviews, is a strong yes. In fact, the agencies welcome the change. They welcome the change because the new system promises to provide top executives with more information and a greater opportunity to have an impact on the agency. One problem is the lack of trained personnel to make the system function effectively.

This article also illustrates reasonably well the role of the Bureau of the Budget.

The author quotes Henry Rowen, "When you get to an inner core of values where people differ, analysis stops. But analysis lays bare these differences."

A brief comparison is provided between the old and new budget formats for the Coast Guard.

McGilvery, Francis E. "A Management Accounts Structure," *Public Administration Review*, XXVI: 4 (December 1966), 277-283. (B)

PPBS brings together planners, budgeters, accountants, executives--all with their own private language. The success of the program, the author contends, depends on a common language. He proposes a "management accounts structure" based on the practice in the Department of Labor.

Mason, Thomas R. "A Basis for Program Planning Higher Education," *Society for College and University Planning Quarterly*, I: 3 (December 1967), 1-4.

The author declares that the qualitative values of a college's "products" cannot be measured, they must be judged. However, the organized instructional program lends itself to quantitative description as the basis for estimating the resources required to support it.

A model is provided based on the author's experience at the University of Rochester.

Robinson, Daniel D. and W. Lynn Fluckiger. "Computer-Assisted Planning for Colleges and Universities," *Management Controls*, XV: 4 (April 1968), 77-85. (C)

The authors stress the growth aspects of higher education and the burdens the growth places on careful placement of scarce resources. Recommendations include the application of PPBS and the utilization of a computer model for planning.

A case study is provided--Fairfax University.

Rowen, Henry S. "PPBS: What and Why," *Civil Service Journal* (January-March 1966), 5-9. (A)

The assistant director, Bureau of the Budget, provides a brief history, description and analysis of PPBS. The article is not written in technical terms.

Schelling, Thomas C. "PPBS and Foreign Affairs," *The Public Interest*, No. 11 (Spring 1968), 26-36. (A)

This article was originally prepared for the Subcommittee on National Security and International Operations, United States Senate (The Jackson Subcommittee). Its merit is that it places the discussion in a policy area not dominated by economic thinking and economic measures. Schelling does restate a familiar refrain: "... PPBS is a method or procedure whose worth depends on the skill and wisdom of the people who use it."

Schick, Allen. "The Road to PPB: The Stages of Budget Reform," *Public Administration Review*, XXVI: 4 (December 1966), 243-258 (B)

The *PAR* for December 1966 is devoted to a symposium on PPBS with several contributors. It is a valuable basic document.

Schick traces budget reforms from 1920 to date. The Budgeting and Accounting Act of 1961 is his base. Basically he views three stages of development: Control, Management and Planning. His conclusion is that the "ethos of budgeting will shift from justification to analysis."

Seligman, David. "McNamara's Management Revolution," *Fortune*, LXXII: 1 (July 1965), 117-120, 246-250. (A) (B)

The author traces in journalistic style the management revolution McNamara introduced in the DOD. Included is a sketch of Mr. Hitch's "Marvelous Budget-Making Machine."

A related article by the staff of *Fortune* is "Systems Analysis by Land, Air, and Sea" which relates in laymen's language Alain Enthoven's analytical response to McNamara's question: How many more transports should the Defense Department be ordering?

Takasiki, Richard S. "Translate Programs into Dollars with Federally-Tested Budget," *College and University Business*, 42: 5 (May 1967), 78-80. (C)

The author, Vice President for Business, University of Hawaii, looks at the new Federal budget process as a means for academic institutions to stress outputs rather than inputs, or program budgeting.

Tough, Coulson and James Skarp. "A Systems Approach to Budgeting Can Open Communication Bottlenecks," *College and University Business*, 44: 5 (May 1968), 68-72. (C)

The authors relate their experiences at the University of California, Irvine. They developed a systems approach to planning which united capital and operating budgets. Basic to the system was the management information system (MIS).

A brief bibliography is provided.

Ways, Max. "The Road to 1977," *Fortune*, LXXV: 1 (January 1967), 93-95, 194-197. (B)

Ways examines the means available to prepare for the future. He includes in his techniques both PPBS and systems analysis. Of systems analysis he says: "This involves ways of arraying ends and means so that decision-makers have clearer ideas of the choices open to them and better ways of measuring results against both expectations and objectives."

Of the techniques associated with PPBS he says: "They are beginning to be recognized as the greatest advance in the art of government since the introduction nearly a hundred years ago of a civil service based upon competence."

Wildavsky, Aaron. "The Political Economy of Efficiency: Cost Benefit Analysis, Systems Analysis, and Program Budgeting," *Public Administration Review*, XXVI: 4 (December 1966), 292-310. (B)

The author, a professor of political science, makes the argument that efficiency in the economic realm may not be the only consideration in the political realm. He recognizes the value of PPBS, of systems analysis, and of cost/benefit studies, but he also recognizes that decisions must be made in the political realm. While economists and analysts should not dominate political discussion, neither should political scientists ignore economics reality.

V. GOVERNMENT PUBLICATIONS

State of California. Department of Finance. *Programming and Budgeting System*, 1967,,66 pp. (D)

The guide for utilization of the program budgeting method in the State of California. Introduced under former Governor Edmund G. Brown, it has been continued under Governor Ronald Reagan.

The directions seem to follow closely those prepared by the U. S. Bureau of the Budget.

Several appendices provide a chronology of the development of the system over two state administrations.

State of New York. *Guidelines for Integrated Planning-Programming-Budgeting*. Prepared by the Office of Planning Coordination and the Division of the Budget, Albany, 1967. 64 pp. (D)

The guide for the State of New York to be used in the installation of PPBS.

U. S. Bureau of the Budget. Bureau of the Budget Bulletin No. 66-3. Washington, October 12, 1965. 13 pp. (D)

This bulletin is the first follow-up to heads of departments and agencies after President Johnson declared his intent to install PPBS throughout all Federal agencies. Outlined are the main components of the system with directions for applying them to the budget preparation.

U. S. Bureau of the Budget. Bureau of the Budget Bulletin No. 66-3 (Supplement). Washington, February 21, 1966. 31 pp. (D)

The supplement provides added information in detail on two aspects of PPBS--the Program and Financial Plan (PFP) and the Program Memoranda (PM). Both the PFP and PM had to be submitted to the BOB by May 1, 1966. Both are essential to the budget preview which is conducted in the spring.

The PFP is the budget in program format. The PM provides the analytic backup for the program categories in the PFP.

Attachments provide illustrative guidelines.

U. S. Bureau of the Budget. Bureau of the Budget Bulletin No. 68-2. Washington, July 18, 1967. 11 pp. (D)

This bulletin replaces Bulletin No. 66-3 and the supplement to it. The directions reflect many refinements following almost two years of experience. Definitions are much sharper. An illustrative annual cycle for budget preparation is included.

U. S. Bureau of the Budget. Bureau of the Budget Bulletin No. 68-9. Washington, April 12, 1968. 16 pp. (D)

This bulletin supersedes BOB Bulletin No. 68-2. It is a set of guidelines to heads of executive departments and agencies and includes the latest directions for preparing budgets under PPBS. Greater emphasis is placed on analysis to support program decisions. Establishes a test of five-year projection procedures to improve future guidelines in this area.

U. S. Congress. *Hearings Before the Subcommittee on Economy in Government of the Joint Economic Committee, Congress of the United States.* 90th Cong., 1st Sess., Sept. 14, 19, 20 and 21, 1967. (B) (D)

A thorough analysis of PPBS is made by experts at state and national levels, from agencies and universities and corporations. Testimony taken includes a statement from William Gorham (HEW). Several speakers comment on the introduction of PPBS in Wisconsin. The chairman, Senator William Proxmire, gave the following purpose for the investigation:

> At the present time, the cash flow through the Federal sector amounts to approximately $175 billion. In addition, State and local governments now account for more than $60 billion. Certainly at a time when approximately 30 per cent of our national income flows through the public sector, it is of the utmost importance that our policy-makers be armed with the best possible tools for evaluating the effectiveness of our public programs and expenditures.

U. S. Congress. Joint Committee on the Organization of Congress. *Hearings.* (pages 1775-1873) 89th Congress, 1st Session. Washington, D. C.: U. S. Government Printing Office, 1965. (B)

Charles L. Schultze, then Director of the Budget, presents his views on PPBS.

U. S. Senate. Committee on Government Operations, Subcommittee on Inter-governmental Relations. *Criteria for Evaluation in Planning State and Local Programs, A Study.* 90th Congress, 1st Session (July 21, 1967). Washington, D. C.: U. S. Government Printing Office, 1967. (B)

Senator Edmund S. Muskie expressed a concern, shared by many governors, about the ability of the states to be effective partners with the Federal government unless the states could improve their abilities to make decisions. He invited Harry P. Hatry to relate PPBS to the state dilemma. Hatry's study is entitled "Criteria for Evaluation in Planning State and Local Programs."

Bibliography included. Illustrative program structure presented.

U. S. Senate, Subcommittee on National Security and International Operations, Committee on Government Operations. *Planning-Programming-Budgeting*. 90th Congress, 1st Session and 2nd Session, 1967 and 1968.

To date the Jackson Subcommittee has produced eight publications in the examination of PPBS.

1. "Initial memorandum" Briefly defines PPBS, traces its application in the DOD, relates it to the State Department, and suggests implications for the President and Congress. August 11, 1967.

2. "Official Documents" Includes the basic documents relating to PPBS: President's statement to the Cabinet (August 25, 1965), President's news conference (August 25, 1965), President's Memorandum to Heads of Departments (November 17, 1966), excerpt from President's Budget Message (January 24, 1967), an excerpt from President's Message The Quality of American Government (March 17, 1967).

   Also included in full is the Bureau of the Budget Bulletin No. 68-2 (July 18, 1967).

3. "Selected Comment" A collection of eight articles on PPBS and for systems analysis by experts: Alain C. Enthoven, Charles J. Hitch, Klaus Knorr, Frederick C. Mosher, David Novick, Admiral H. G. Rickover, Harry S. Rowen and Aaron Wildavsky. (Novick's article is entitled "Origin and History of Program Budgeting.")

4. "Hearings, Part 1" Consists of the testimony of Charles L. Schultze, then Director of the Budget (August 23, 1967). Includes detailed question-answer sequence between several senators and the director.

5. "Hearings, Part 2" Consists of the testimony of Alain C. Enthoven, Assistant Secretary of Defense (September 27 and October 18, 1967). A substantial segment of the testimony is taken up with the TFX (F-111). Systems analysis was not used in that decision because DOD did not have the systems analysis techniques fully developed and implemented.

6. "Hearings, Part 3" Consists of the testimony of Elmer B. Staats, Comptroller General of the United States.

7. "Uses and Abuses of Analysis" A paper by this title was prepared for the Subcommittee by James R. Schlesinger of the RAND Corporation. Dr. Schlesinger cautions his readers about systems analysis. Analysis is no better than the people, design and facts put into it.

8. "Budget Bureau Guidelines of 1968" Includes a copy of BOB Bulletin No. 68-9 which supersedes Bulletin No. 68-2. To date, these have been three general sets of directives to agencies on the implementation of PPBS.

   Also included are brief comments by Charles J. Zwick, Director, Bureau of the Budget, on the new guidelines.